

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:)	Examiner: ARANA, Louis
HAM, C.L.G.)	
)	Art Unit: 2859
Serial No.: 10/565,290)	
)	Confirmation: 9787
Filed: January 20, 2006)	
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For: AUTOMATED POSITIONING)	
OF MRI SURFACE COILS)	
)	
Date of Last Office Action)	
September 8, 2006)	
)	
Attorney Docket:)	Cleveland, Ohio 44114
PHNL030899US / PKRZ 2 01278)	January 10, 2008

APPEAL BRIEF

Commissioner For Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This is an Appeal from the Final Rejection of April 9, 2007.

Authorization to charge the Appeal Brief fee to the applicant's deposit account
is attached.

CERTIFICATE OF ELECTRONIC TRANSMISSION

I certify that this Appeal Brief and accompanying documents in connection with U.S. Serial No. 10/565,290 are being filed on the date indicated below by electronic transmission with the United States Patent and Trademark Office via the electronic filing system (EFS-Web).

Jan 10, 2008
Date

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I. REAL PARTY IN INTEREST

The Real Party in Interest is the Assignee, KONINKLIJKE PHILIPS ELECTRONICS, N.V.

II. RELATED APPEALS AND INTERFERENCES

None

III. STATUS OF CLAIMS

Claims 1-7 are pending. No claims have been cancelled.

Claims 1-7 stand rejected under 35 U.S.C. § 103 as being unpatentable over Fuderer (US 7,027,854) in view of Murphy (US 6,294,915).

Claims 1-7 are on appeal.

IV. STATUS OF AMENDMENTS

An amendment after final accompanies this Appeal Brief. No other amendments after final have been filed in conjunction with this application.

Because the accompanying amendment merely corrects minor typographical and other errors and does not affect the scope of the claims, it is believed that this amendment will be entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Regarding antecedent basis for claim 1, a magnetic resonance imaging method involving a *field-of-view*, wherein a receiver antenna is employed to acquire magnetic resonance signals from an object to be examined, and a non-selective RF excitation is applied followed by at least one temporary magnetic gradient field to generate a receiver response signal from the receiver antenna, and a relative adjustment of the *field-of-view* and the object to be examined is carried out on the basis of the receiver response signal. (page 2, lines 7-14; page 5, line 17 – page 6, line 7).

Regarding antecedent basis for claim 2, a magnetic resonance imaging method as claimed in Claim 1, wherein the object is positioned on the basis of the receiver response signal. (page 2, line 15; page 6, lines 24-26; page 7, lines 8-9, 12-13).

Regarding antecedent basis for claim 3, a magnetic resonance imaging method as claimed in Claim 1, wherein the *field-of-view* is positioned on the basis of the receiver response signal. (page 2, line 14; page 6, lines 22-24; page 7, lines 5-6).

Regarding antecedent basis for claim 4, a magnetic resonance imaging method as claimed in Claim 1, wherein a surface receiver coil is employed as the receiver antenna. (page 2, lines 25-28; page 4, line 30 – page 5, line 7; page 7, lines 18-26).

Regarding antecedent basis for claim 5, a magnetic resonance imaging method as claimed in Claim 1, wherein a synergy coil having several coil elements is employed as the receiver antenna, the receiver response signals are generated from individual coil elements, and coil elements are selected on the basis of the receiver response signals. (page 2, lines 29-32; page 5, lines 8-16; page 6, lines 26-28).

Regarding antecedent basis for claim 6, a magnetic resonance imaging system involving a *field-of-view*, comprising a receiver antenna (3) to acquire magnetic resonance signals from an object to be examined, and an RF transmission system (21, 22) to generate a non-selective RF excitation (7, 7a, 7b, 7c) followed by at least one temporary magnetic gradient field (8, 9, 10) to generate a receiver response signal (9, 12, 13) from the receiver antenna, and a control unit (23) to calculate a relative adjustment of the *field-of-view* and the object to be examined is carried out on the basis of the receiver response signal.

Regarding antecedent basis for claim 7, a computer readable medium encoded with a computer program comprising instructions to activate an RF transmission system to generate a non-selective RF excitation followed by at least one temporary magnetic gradient field to generate a receiver response signal from a receiver antenna, and calculate a relative

adjustment of the *field-of-view* and an object to be examined is carried out on the basis of the receiver response signal. (page 3, line 33 – page 4, line 3).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 1-7 distinguish patentably and unobviously in the sense of 35 U.S.C. § 103 over Fuderer as modified by Murphy.

VII. ARGUMENT

A. Background

Fuderer is concerned with superimposing on a large area anatomical survey image a series of very small field-of-view single images generated by magnetic resonance signals received by a microcoil (6) at the end of a catheter (1) which receives magnetic resonance signals from an immediately surrounding sub-region of the subject (col. 1, lines 9-17). These single images of very small regions surrounding the interventional instrument tip are superimposed on an anatomical survey image covering the examination through which the catheter is expected to move (col. 5, lines 57-62; col. 5, line 53 – col. 6, line 14). However, in order to superimpose these very small region single images on the anatomical survey image, one needs to know the location of the single image. Fuderer determines the location of each image by determining the location of the microcoil (col. 6, lines 58-64, described in more detail at col. 7, line 50 – col. 9, line 23).

Murphy is directed to a conventional open magnet which has a nominal field-of-view (40) in a generally spherical region on a central axis of the upper and lower magnets. A first alignment laser light (26) is positioned a fixed known distance from a second alignment laser light (28) (col. 3, lines 19-21). The operator aligns the desired scan area (region of interest) with the vertical light beam (36) from the exterior alignment light laser (26) (col. 3, lines 21-23). The patient table is then moved automatically the known fixed distance between the exterior alignment laser light (26) and the interior alignment laser light (28). The light beam (44) from the interior laser light is then used to assure that the desired scan area of the patient is accurately centered within the field-of-view (40). More specifically, if a pilot scan shows that the desired scan area of the patient is not properly in the field-of-view (40), the light beam (44) provides an indicator to help the operator move the patient such that the desired scan area is within the nominal field-of-view. (col. 3, lines 43-53).

The present application is concerned with determining where the field-of-view of a coil actually is. The interior laser light (28) of Murphy shows the operator the vertical axis along which the center of the field-of-view is supposed to lie. However, for various reasons, the field-of-view is not always where it is expected to be. As a first example, surface coils lie on the surface of the patient. Different patients have different body contours and different body parts of the same patient have different slopes or angles. When the coil is positioned in different orientations, or with different contours, the location of the actual field-of-view changes. The center of the field-of-view can be deeper, shallower, offset to the left or right, offset axially, etc.

As another example, synergy coils have multiple coil elements. The location of the field-of-view changes depending on which combination of coil element is selected and used.

In magnetic resonance imaging, there are also issues with patient loading. The body of the patient interacts with the fields altering fields in the region of interest which can alter the location of the actual field-of-view. The patient loading effect varies from patient to patient and with the region of the patient. The loading effects are typically different in a large patient or portion of a patient relative to a small patient or a smaller portion of a patient.

Thus, unlike Fuderer who determines the location of a microcoil at the end of a catheter and Murphy who determines the vertical axis along which a field-of-view is supposed to lie, the present application discloses a technique for determining where the field-of-view actually is.

B. Claims 1-5 Distinguish Patentably Over the References of Record

1. Claim 1 Distinguishes Patentably Over the References of Record

Claim 1 calls for an antenna employed to acquire magnetic resonance signals and a non-selective RF excitation and gradient magnetic field combination to generate a receiver response signal from the antenna. Fuderer does use non-selective RF excitation in

combination with a magnetic gradient field to determine the location of the microcoil (6) at the tip of the catheter.

Claim 1 goes on to call for a relative adjustment of the field-of-view and the object to be carried out based on said receiver response signal. By contrast, Fuderer uses the receiver response signal to determine the location of the microcoil such that the resultant very small region single image which is generated by the microcoil at the present catheter tip location can be superimposed at the correct location on the anatomical survey image. Fuderer does not move the patient to reposition the microcoil at the isocenter of an open or other main magnet. Fuderer makes no suggestion of moving the patient in accordance with the receiver response signal. To the contrary, it is submitted that Fuderer teaches against such motion because such movement of the patient would move the patient and the microcoil relative to the anatomical survey image making superimposition of the small scale image on the anatomical survey image more difficult and less accurate. Also, Fuderer makes no suggestion that the field-of-view should be moved based on the receiver response signal. Rather, the catheter motion is constrained by the blood vessel and the microcoil only moves along the blood vessel. The motion of the catheter is not in any way controlled by or carried out on the basis of the receiver response signal.

Murphy does not cure this shortcoming of Fuderer. Murphy uses laser lights (26, 28) in order to position a region of interest of a subject relative to the examination region of an MRI system. If the Murphy laser lights were used in combination with Fuderer, it is submitted that one would use the Murphy laser lights in order to initially position the patient such that the anatomical survey image is an image of the large region through which the catheter will pass, e.g. of the region of Figure 1 of Fuderer. Neither Fuderer nor Murphy suggests making a relative adjustment of the field-of-view and the object based on a receiver response signal nor does either provide any motivation to do so. Accordingly, it is submitted

that claim 1 and claims 2-5 dependent therefrom distinguish patentably and unobviously over the references of record.

2. Claim 2 Distinguishes Patentably Over the References of Record

Claim 2 calls for the object to be positioned based on the receiver response signal. In Fuderer, the patient (5) is positioned before any receive response signals are generated. Repositioning the patient of Fuderer would cause a misalignment with the anatomical survey image. Murphy who positions the patient (32) based on laser lights does not cure this shortcoming of Fuderer. Accordingly, it is submitted that claim 2 distinguishes patentably over the references of record.

3. Claim 3 Distinguishes Patentably Over the References of Record

Claim 3 calls for the field-of-view to be positioned based on the receiver response signal. In Fuderer, the field-of-view is not positioned based on the receiver response signal from the microcoil (6). Rather, the field-of-view for the anatomical survey image remains stationary. Movement of the microcoil is based on movement of the catheter along a blood vessel and is not made on the basis of a receiver response signal. In Murphy, the laser lights (26, 28) are the basis for moving the patient. There is no suggestion in Murphy of positioning the field-of-view nor any enabling disclosure as to how one could reposition the field-of-view.

Accordingly, it is submitted that claim 3 distinguishes patentably and unobviously over the references of record.

4. Claim 4 Distinguishes Patentably Over the References of Record

Claim 4 calls for a surface receiver coil to be employed as the receiver antenna. Neither Fuderer nor Murphy disclose a surface receiver coil. Fuderer discloses a whole body RF coil (21) and the microcoil (6) on the end of the catheter. Murphy fails to cure the shortcoming. Murphy appears to have whole body RF coils but fails to disclose a surface

coil. Because neither Fuderer nor Murphy disclose that the receiver antenna is a surface receiver coil, it is submitted that claim 4 distinguishes patentably and unobviously over the references of record.

5. Claim 5 Distinguishes Patentably Over the References of Record

Claim 5 calls for a synergy coil having several coil elements which is to be employed as the receiver antenna. Moreover, claim 5 calls for selecting the coil elements on the basis of the receiver response signals. The microcoil (6) of Fuderer is not disclosed as being a synergy coil or a coil having several coil elements. Fuderer does not say whether the whole body RF coil (21) is a synergy coil. However, even if it is, there is no suggestion of selecting the coil elements based on the receiver response signal. In Fuderer, a paragraph which starts at col. 5, line 63 and runs through col. 6, line 13 does mention a synergy coil combination. However, rather than describing a synergy coil in the disclosed system, Fuderer compares the difficulties in splicing together the very small region images from the microcoil (6) to problems encountered in synergy coil image reconstruction. Murphy which neither discloses a synergy coil nor selecting coil elements of a synergy or other coil based on receiver response signals fails to cure this shortcoming of Fuderer. Accordingly, it is submitted that claim 5 distinguishes patentably and unobviously over the references of record.

6. Claim 6 Distinguishes Patentably Over the References of Record

Claim 6 calls for a control unit which calculates a relative adjustment of the field-of-view and the object on the basis of the receiver response signal. Fuderer does not disclose calculating a relative adjustment of the field-of-view and the object. Rather, the receiver response signal is used to determine the location of the microcoil, hence the location of the small region single image generated by it. By knowing the location of the small region single images, the small region single images can be accurately superimposed on the anatomical survey image. Fuderer does not disclose and provides no motivation to calculate a relative

adjustment of the field-of-view and the object much less to make such a calculation based on the receiver response signal. Murphy does not cure this shortcoming of Fuderer. Fuderer does not calculate a relative adjustment to the field-of-view and the object on the basis of the receiver response signal. Murphy uses laser lights (26, 28) to assist in positioning the object relative to the field-of-view but makes no suggestion of calculating an appropriate relative adjustment of the field-of-view and the object based on receiver response signals and provides no motivation to add this feature to Fuderer.

Accordingly, it is submitted that claim 6 distinguishes patentably and unobviously over the references of record.

7. Claim 7 Distinguishes Patentably Over the References of Record

Claim 7 calls for a computer readable medium encoded with a computer program which activates an RF system to generate a non-selected RF excitation followed by a magnetic gradient field to generate a receiver response signal from a receiver antenna. Moreover, claim 7 calls for a calculation of a relative adjustment of the field-of-view and the object to be carried out on the basis of the receiver response signal. Fuderer uses the receiver response signal from the microcoil (6) to determine its location. There is no suggestion in Fuderer of either calculating a relative adjustment of the field-of-view and the object nor to carry out a relative adjustment of the field-of-view and the object based on the receiver response signal. Movement of the microcoil (6) is based on advancement of the catheter through the blood vessel and is not carried out, calculated, or determined based on the receiver response signal. Murphy fails to cure these shortcomings of Fuderer. Murphy has laser lights (26, 28) to help the operator align the region of interest of the subject with the fixed field-of-view of the open MRI magnet. There is no suggestion or enabling disclosure that this adjustment can be calculated or determined on the basis of a receiver response signal from a receiver antenna.

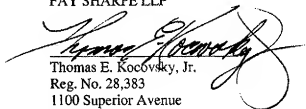
Accordingly, it is submitted that claim 7 distinguishes patentably and unobviously over the references of record.

CONCLUSION

For the reasons set forth above, it is submitted that all claims distinguish patentably and unobviously over the references of record. An early reversal of the Examiner's rejections is requested.

Respectfully submitted,

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APPENDICES

VIII. CLAIMS APPENDIX (with the amendment filed herewith entered)

Claims involved in the Appeal are as follows:

1. A magnetic resonance imaging method involving a *field-of-view*, wherein
 - a receiver antenna is employed to acquire magnetic resonance signals from an object to be examined, and
 - a non-selective RF excitation is applied followed by at least one temporary magnetic gradient field to generate a receiver response signal from the receiver antenna, and
 - a relative adjustment of the *field-of-view* and the object to be examined is carried out on the basis of the receiver response signal.
2. A magnetic resonance imaging method as claimed in Claim 1, wherein the object is positioned on the basis of the receiver response signal.
3. A magnetic resonance imaging method as claimed in Claim 1, wherein the *field-of-view* is positioned on the basis of the receiver response signal.
4. A magnetic resonance imaging method as claimed in Claim 1, wherein a surface receiver coil is employed as the receiver antenna.
5. A magnetic resonance imaging method as claimed in Claim 1, wherein
 - a synergy coil having several coil elements is employed as the receiver antenna,
 - the receiver response signals are generated from individual coil elements, and
 - coil elements are selected on the basis of the receiver response signals.
6. A magnetic resonance imaging system involving a *field-of-view*, comprising
 - a receiver antenna to acquire magnetic resonance signals from an object to be examined, and
 - an RF transmission system to generate a non-selective RF excitation followed by at least one temporary magnetic gradient field to generate a receiver response signal from the receiver antenna, and
 - a control unit to calculate a relative adjustment of the *field-of-view* and the object to be examined is carried out on the basis of the receiver response signal.

7. A computer readable medium encoded with a computer program comprising instructions to
- activate an RF transmission system to generate a non-selective RF excitation followed by at least one temporary magnetic gradient field to generate a receiver response signal from a receiver antenna, and
 - calculate a relative adjustment of a *field-of-view* and an object to be examined is carried out on the basis of the receiver response signal.

IX. EVIDENCE APPENDIX

None

X. RELATED PROCEEDINGS APPENDIX

None